UM0501
User manual

STM8/128-EVAL demonstration firmware

Introduction

This document describes the demonstration firmware running on the STM8/128-EVAL evaluation board. You can use it to evaluate the capabilities of the microcontroller and of the on-board peripherals.

The evaluation board is delivered with the demonstration firmware stored in the embedded Flash memory of the microcontroller.

The firmware is based on the STM8S firmware library, and provides an example of how to use this library. It is divided into various smaller demonstration applications (demo)

In case the STM8/128-EVAL evaluation board is not factory-programmed or the demonstration application has been erased, you can reprogram the demonstration firmware into the STM8S2xx Flash memory by following the instructions provided in *Section 3*.

For more information about the evaluation board itself, please read the Evaluation Board user manual.

Note: Some demonstration applications require the option byte configuration to run properly. Refer to Section 2.10: BEEPER demo.

Contents

1 User interface 3

1.1 Menu structure 3

1.2 Documentation conventions 3

1.3 Navigating menus and sub-menus 4

2 Demonstration applications 5

2.1 Menu overview 5

2.2 Welcome screen and main menu 5

2.3 Help mode 6

2.4 ADC demo 1 6

2.5 ADC demo 2 7

2.6 ADC demo 3 7

2.7 TIMER demo 8

2.8 PWM demo 1 9

2.9 PWM demo 2 10

2.10 BEEPER demo 11

2.11 MICROSD demo 12

2.12 GAME demo 13

2.13 SYSTEM demo 14

2.14 About menu 14

3 Upgrading the demonstration firmware 15

4 STM8S peripherals used 16

5 Demo firmware architecture 17

6 Revision history 18

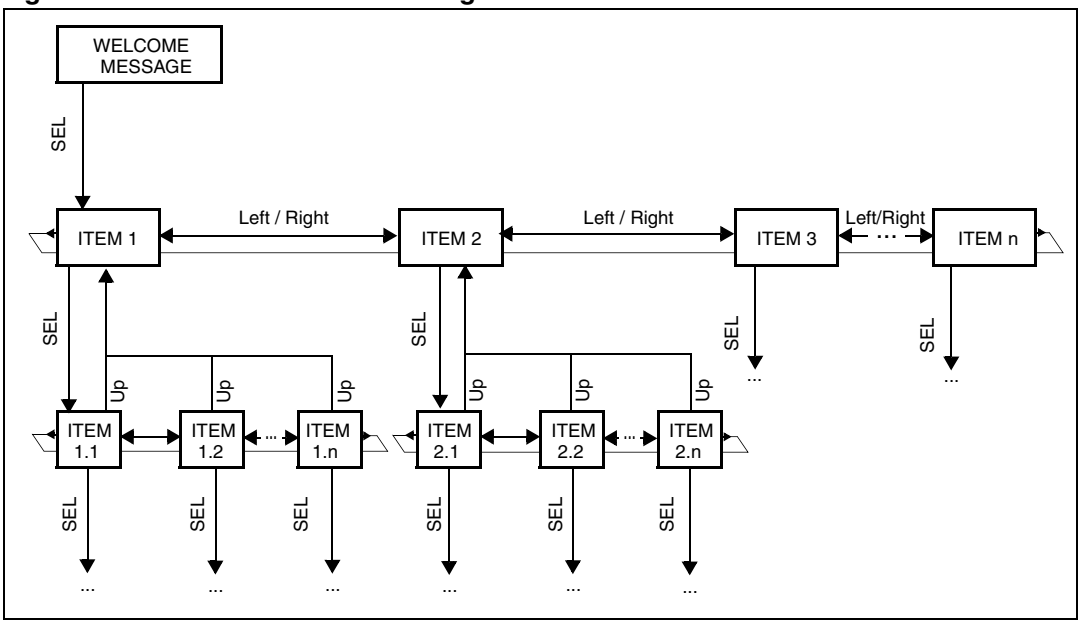
1 User interface

1.1 Menu structure

The demonstration firmware user interface is based on a circular navigation menu, with submenus, item selection and back capability.

Figure 1 shows the menu system of the demonstration. The top row of items represents the main menu.

Figure 1. Menu structure and navigation



1.2 Documentation conventions

In this document, the keywords in bold indicate user actions on the joystick (5-way switch). The KEY button (1-way switch) and the RV1 potentiometer follow the conventions shown in *Table 1*.

Table 1. Documentation conventions

Keyword	User action
LEFT	Press joystick to the left
RIGHT	Press joystick to the right
UP	Press joystick up
DOWN	Press joystick down
SEL	Press joystick center
KEY	Press KEY button
RV1	Rotate RV1 potentiometer

1.3 Navigating menus and sub-menus

To navigate the menus and sub-menus, perform the following actions as required:

RIGHT: Navigates to the next menu or sub-menu items on the right.

LEFT: Navigates to the next menu or sub-menu items on the left.

SEL: Enters sub-menu.

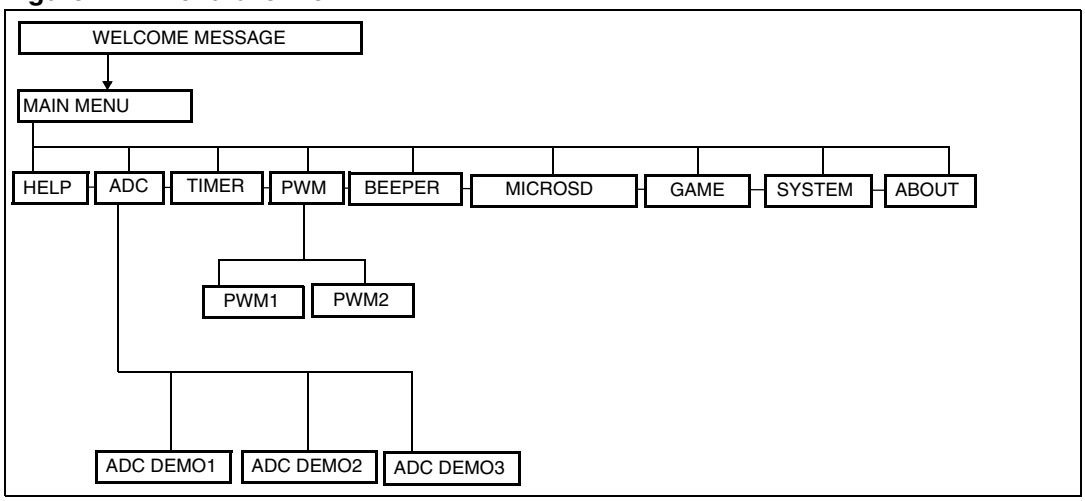
UP: Exits from a sub-menu.

2 Demonstration applications

2.1 Menu overview

The *Figure 2* shows all the menu and submenus of the demonstration applications.

Figure 2. Menu overview

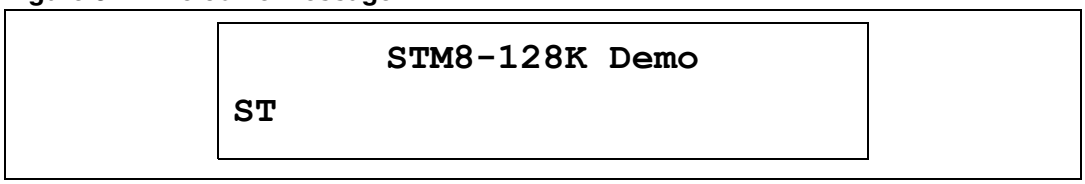


The following sections provides a detailed description of each part of the demonstration firmware.

2.2 Welcome screen and main menu

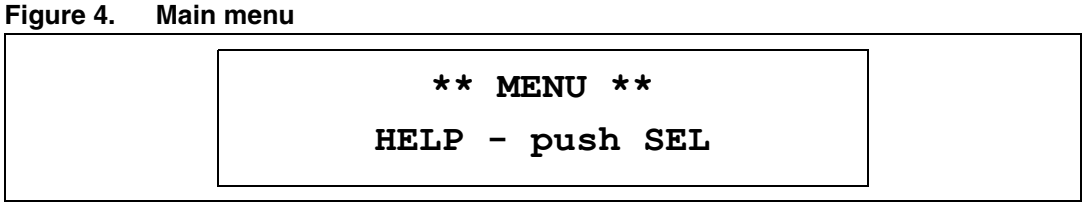
After a board RESET, a welcome message is displayed on the first line, the ST logo is displayed moving on the second line and a melody is played (see *Figure 3*). The introduction melody can be changed by using either PWM demo 1 or PWM demo 2 (see *Section 2.8* and *Section 2.9*).

Figure 3. Welcome message



Once the melody is played, the main menu is activated and the message shown in *Figure 4* is displayed:

Figure 4. Main menu

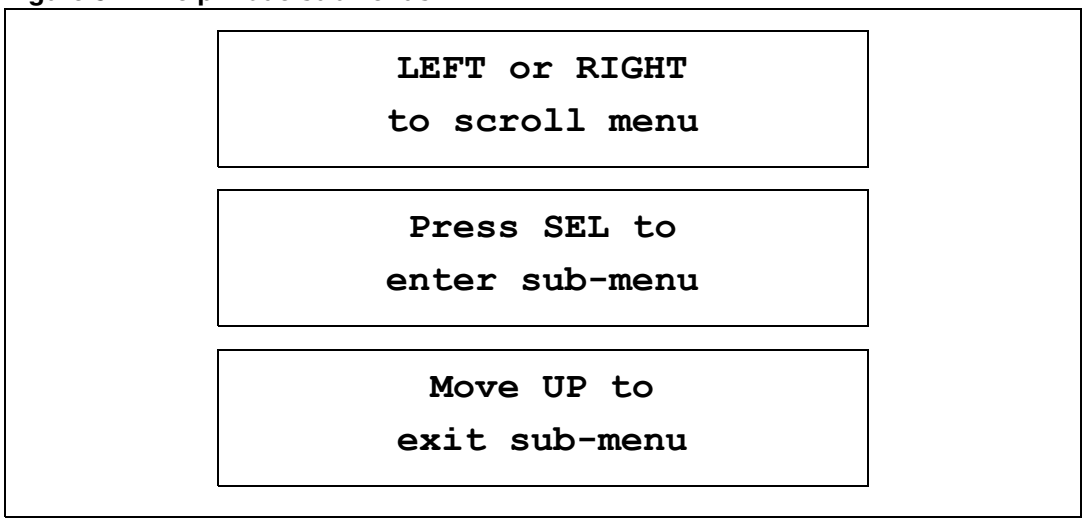


Note: Pressing the joystick in any direction (for around 1 second) ends the melody.

2.3 Help mode

Pressing **SEL** from the main menu enters the *Help* mode. The following messages are displayed sequentially on the LCD screen with a few second delay:

Figure 5. Help mode submenus



To exit this demo, press the joystick **UP**.

2.4 ADC demo 1

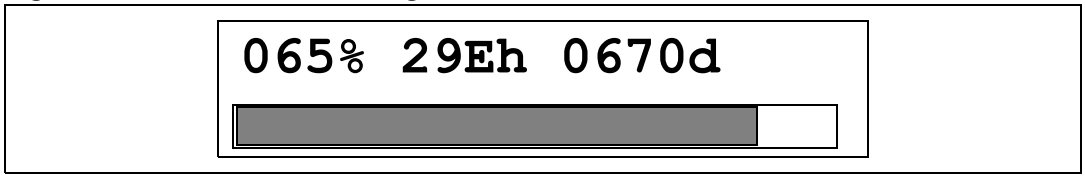
This mode demonstrates the ADC operation that are performed using the **RV1** potentiometer on the evaluation board.

The converted value is displayed in different ways (see *Figure 6*):

- On the LCD first line: in percentage of the ADC range, in hexadecimal and decimal format
- On the LCD second line: in a bar graph from 0% to 100% of the ADC range.
- On the 4 LEDs: each LED represents approximately 25% of the ADC range.

If **KEY** is pressed, the converted value is output also on USART1 and/or USART2 interfaces and/or a sound is played on the buzzer using the timer PWM.

Figure 6. ADC demo 1 message



UP: Press the joystick **UP** to exit this demo.

KEY: Press **KEY** repeatedly to enable the output of each converted value option in turn:

LCD only
LCD+Buzzer
LCD+USART1
LCD+USART2
LCD+USART1+USART2
LCD+USART1+USART2+Buzzer
LCD only
etc...

2.5 ADC demo 2

This is the same as ADC demo 1, except that the CN3 connector on the evaluation board is used to enter the analog voltage to be converted.

UP: Press the joystick **UP** to exit this demo.

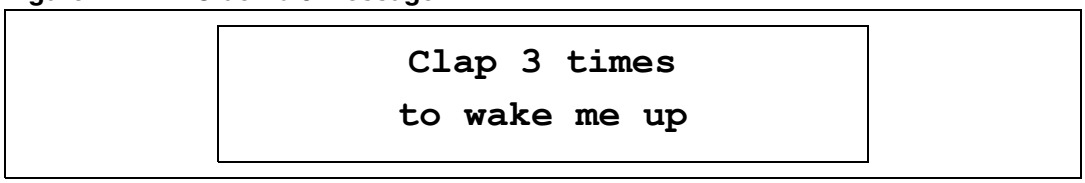
KEY: Press **KEY** to enable/disable output values on USART1, USART2 and buzzer as described in the previous section.

2.6 ADC demo 3

This is the same as ADC demo 1 and ADC demo 2, except that the microphone (U8) is used.

A first message is displayed with a few seconds delay with all LEDs OFF (see *Figure 7*):

Figure 7. ADC demo 3 message



After 3 “noises” are heard, the demo starts and the LCD displays the same messages as in ADC demo 1 and demo 2.

UP: Press the joystick **UP** to exit this demo.

KEY: Press **KEY** to enable/disable output values on USART1, USART2 and buzzer.

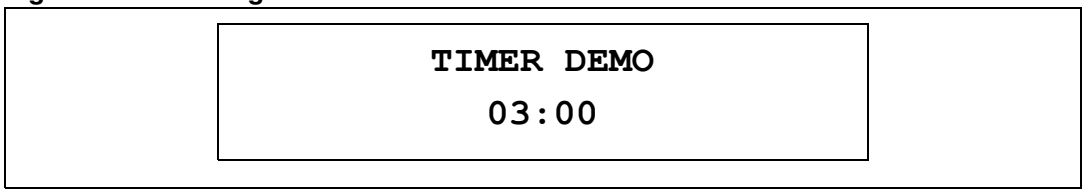
Note: If no sound is detected, you can adjust the microphone level using the RV3 potentiometer. You can also make a sound by touching the microphone.

2.7 TIMER demo

This mode demonstrates the Timer peripheral operation.

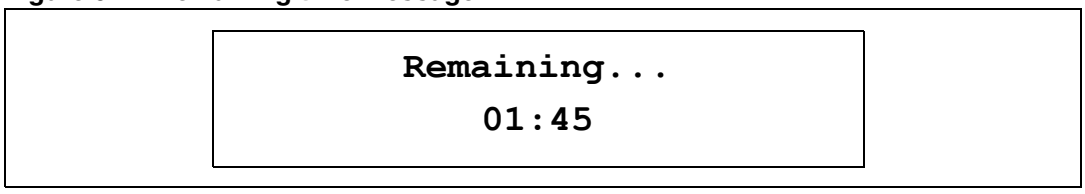
1. To run the TIMER demo, enter the timer start value (from 1 to 18 minutes) using the **RV1** potentiometer (see *Figure 8*).

Figure 8. Entering the timer start value



2. Once the requested value is set, press **SEL** on the joystick to start the timer. The remaining time is displayed on the LCD screen (see *Figure 9*).

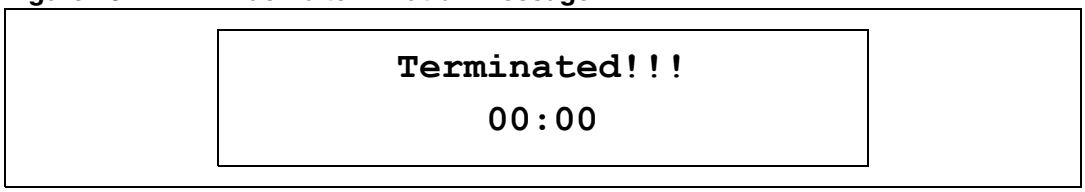
Figure 9. Remaining time message



3. When the value reaches 00:10, a sound is heard for each second elapsed.

   When the value reaches 00:00 the four LEDs flash and the message shown in *Figure 10* is displayed:

Figure 10. TIMER demo termination message



UP: Press the joystick **UP** to exit this demo.

KEY: Press **KEY** repeatedly to divide counter pulse duration by 2 (0.5 second, 0.25 second,... 31.25 ms).

2.8 PWM demo 1

This mode demonstrates the Timer peripheral operating in PWM mode. Make sure that the JP14 jumper is installed in the bottom position (closer to the LCD).

1. Entering the melody (see *Figure 11*):

   The first LCD line shows the position of the note to enter:

   o = Edit mode, the note is selected by using the **RV1** potentiometer.

   x = Protect mode, the note cannot be changed.

   The second LCD line shows the notes to be played with the following convention:

   a/A = LA

   b/B = SI

   c/C = DO

   d/D = RE

   e/E = MI

   f/F = FA

   g/G = SOL

   s/S = silence or pause

   A lowercase letter represent a brief note, and an uppercase letter a long note.

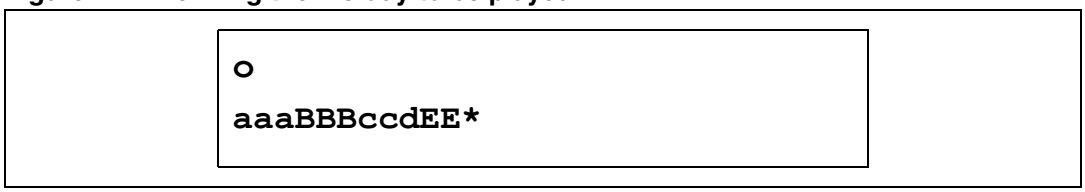
   To modify a note, press the joystick **LEFT** or **RIGHT** to navigate the notes, and use the **RV1** potentiometer. Then press **SEL** to confirm.

   Once all the notes have been defined, enter an end mark to play the melody:

   ***** = End of notes, the melody is played only once.

   8 = End of melody, the melody is played in a loop with varying octaves and note durations.

Figure 11. Defining the melody to be played



2. Playing and saving the melody

- Press **SEL** on the joystick to play the tune indefinitely.
- Press the joystick **UP** to stop the melody.

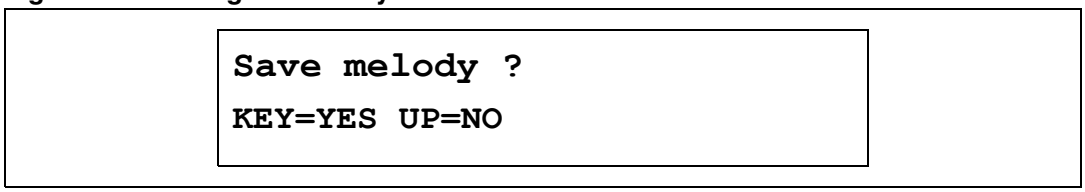
*Note: Keep the joystick pressed **UP** for a short time to allow the action to be taken into account.*

- The second time **UP** is pressed, a message is displayed asking you whether you want to save the melody or not (see *Figure 12*):

  a) If you press the **KEY** button, the melody is saved in the external EEPROM.

  b) If you press **UP** on the joystick, you exit from the demo without saving the melody.

Figure 12. Saving the melody



LEFT/RIGHT: Press the joystick **LEFT** or **RIGHT** to navigate the notes.

SEL: Press **SEL** to confirm a note and go to the next one.

KEY: Press **KEY** to switch between edit and protected modes.

RV1: Use **RV1** potentiometer to define the notes.

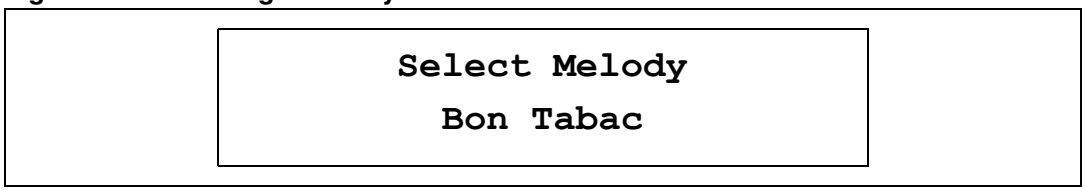
2.9 PWM demo 2

This demo also demonstrates the Timer peripheral operating in PWM mode. Make sure that the JP14 jumper is installed in the bottom position (closer to LCD).

This demo allows to select and play one melody among a selection stored in the Flash memory (see *Figure 13*):

1. Navigate between the melodies by pressing the joystick **LEFT** or **RIGHT**, and press **SEL** to select and play the melody (see *Figure 13*)

Figure 13. Selecting a melody



2. The first time **UP** is pressed, the melody is stopped.

*Note: Keep the joystick pressed **UP** for a short time to allow the action to be taken into account.*

3. The second time **UP** is pressed, a message is displayed asking you to save the melody or not:
   a) If you press the **KEY** button, the melody is saved in the external EEPROM.
   a) If you press **UP**, you exit from the demo without saving the melody.

LEFT/RIGHT: Press the joystick **LEFT** or **RIGHT** to navigate the melodies.

SEL: Press **SEL** to select a melody and play it.

2.10 BEEPER demo

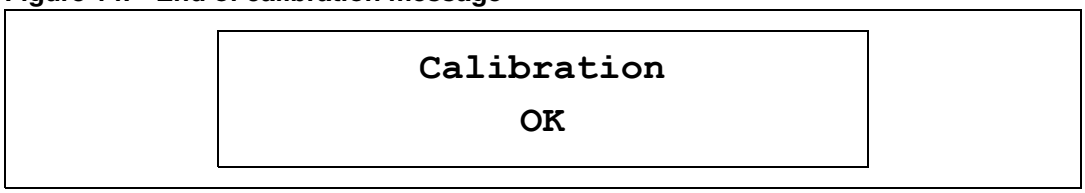
This mode demonstrates the 3 different frequencies that can be output on the BEEP pin. Prior to running the BEEPER demo, perform the following operations:

- Install the JP14 jumper in the top position (closer to the STM8S chip).
- Enable the beep output functionality by setting bit AFR7 of OPT2 option byte to '1' (refer to the datasheets for details).

When this mode is entered, the LSI clock is calibrated.

The message shown in *Figure 14* is displayed at the end of calibration:

Figure 14. End of calibration message



After a short time, another message shows the current output frequency.

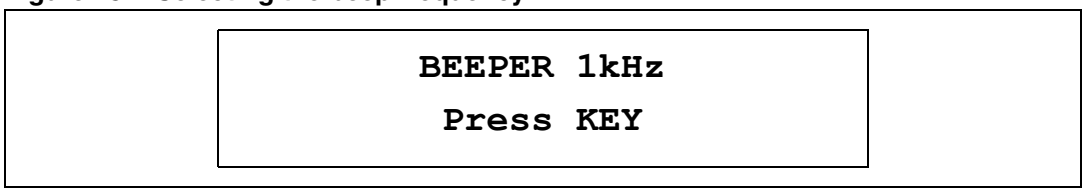
Press the **KEY** button repeatedly to change the frequency in this order:

1 kHz
2 kHz
4 kHz
1-2-4 kHz
OFF
1 kHz etc...

The frequency selected is displayed on the LCD screen (see *Figure 15*)

The LEDs also change depending on the selected frequency.

Figure 15. Selecting the beep frequency



UP: Press the joystick **UP** to exit the demo.

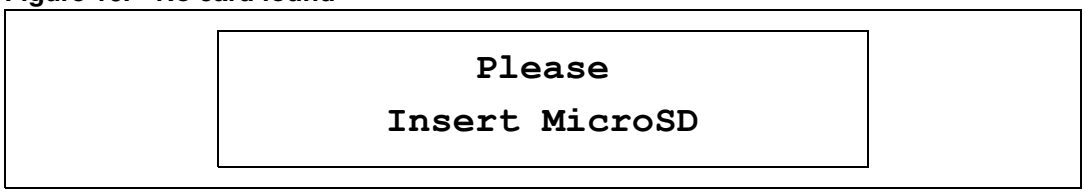
KEY: Press the **KEY** button to change the beeper frequency.

2.11 MICROSD demo

This mode demonstrates the basic operation of the MicroSD card interface.

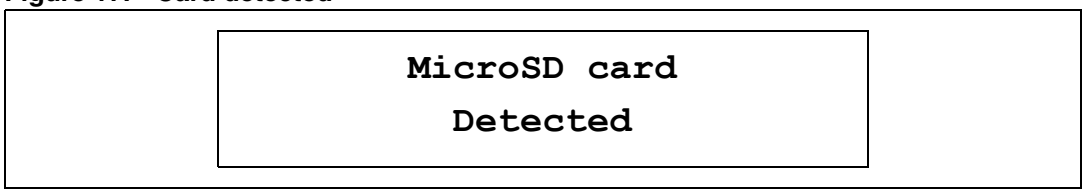
1. When this mode is entered, it checks if a MicroSD card is inserted in the slot.
   – If no card is found, the message shown in *Figure 16* is displayed:

Figure 16. No card found



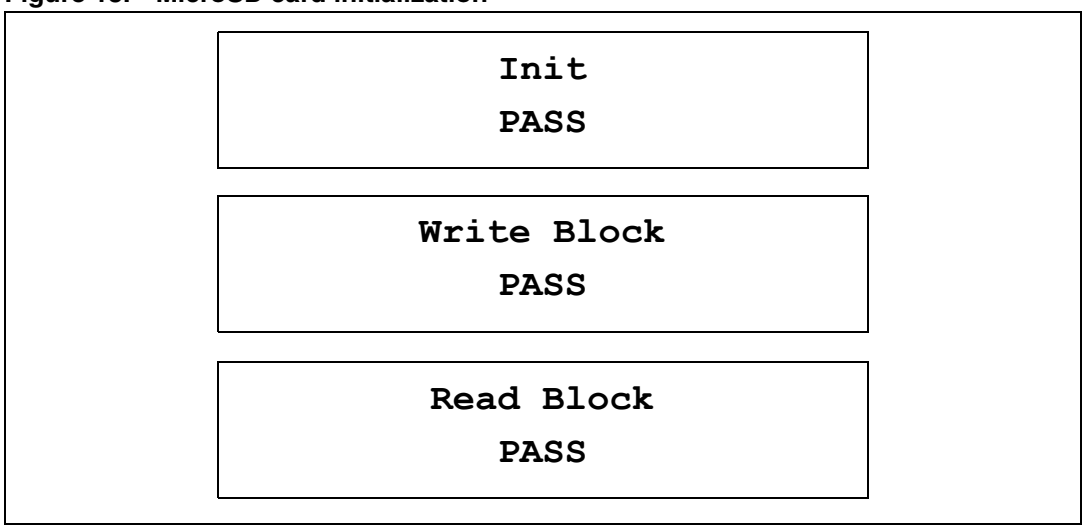
   – When a MicroSD card is detected, another message is displayed (see *Figure 17*):

Figure 17. Card detected



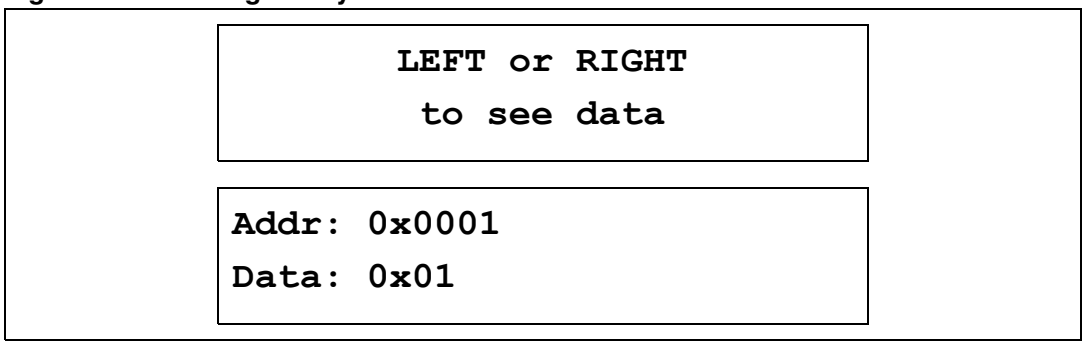
2. Then the MicroSD card is initialized, followed by a Write block (512 bytes) and a Read block operation. See *Figure 18* for the messages displayed consecutively on the LCD screen:

Figure 18. MicroSD card initialization



3. When this phase is complete, the message shown in *Figure 19* is displayed.
   By pressing the joystick to **LEFT** or **RIGHT**, you can display the 512 bytes of data read from the MicroSD card. The data should be equal to the address low byte.

Figure 19. Reading 512 bytes from the MicroSD card



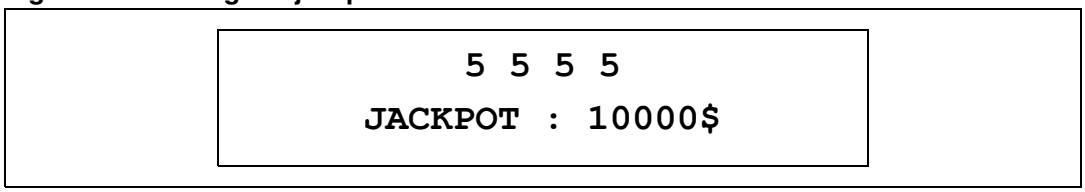
2.12 GAME demo

This little game is a kind of “fruit machine”.

When you press **SEL** the numbers start rolling. Use the **KEY** button to stop each number. The first time the **KEY** button is pressed it stops the first number, then the second number, etc.

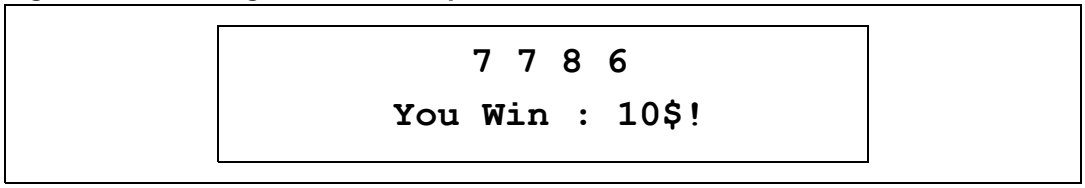
You hit the jackpot if you get 4 identical numbers (see *Figure 20*).

Figure 20. Hitting the jackpot



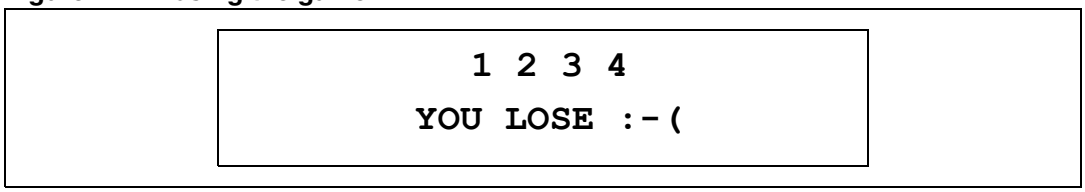
If you get 3 or 2 identical numbers you win a consolation prize (see *Figure 21*).

Figure 21. Winning a consolation prize



If all the numbers are different, you lose (see *Figure 22*).

Figure 22. Losing the game



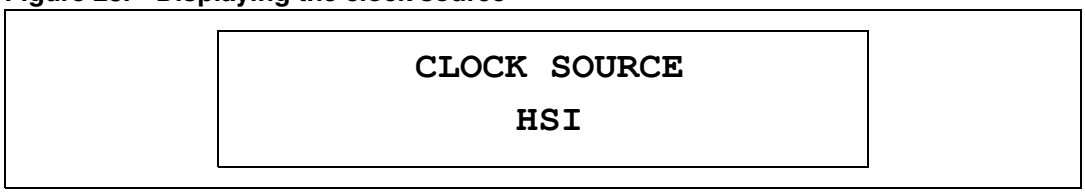
UP: Press the joystick **UP** to exit this menu.

2.13 SYSTEM demo

This menu is used to display system information.

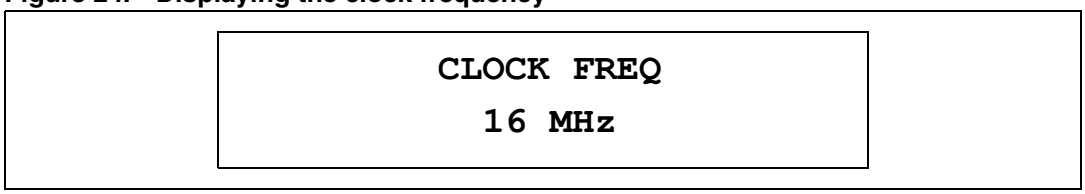
The message displayed on the LCD screen shows the clock source which is used (HSI, LSI or LSE) (see *Figure 23*):

Figure 23. Displaying the clock source



Pressing **SEL** on the joystick displays the clock frequency (see *Figure 24*):

Figure 24. Displaying the clock frequency



Press **SEL** again to go back to the first screen.

During any of the above two messages, you can press **KEY** repeatedly to divide the HSI clock frequency by a divider factor (1, 2, 4, 8, 1,....). The new clock frequency is then displayed.

You can monitor the master clock frequency with an oscilloscope connected to the MCO pin.

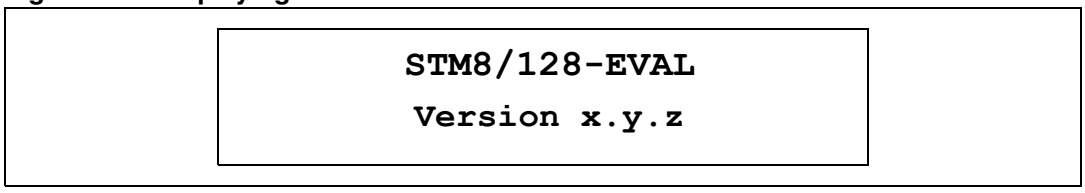
Note: If you select an HSI divider greater than 1, you slow down the whole application. As a result, you will need to press the buttons for longer in order to navigate the menus.

UP: Press the joystick **UP** to exit this menu.

2.14 About menu

This menu shows the firmware version. When this submenu is selected the message shown in *Figure 25* is displayed on the LCD screen:

Figure 25. Displaying the demonstration firmware version



UP: Press the joystick **UP** to exit this menu.

3 Upgrading the demonstration firmware

To upgrade the demonstration firmware running on your board, go through the following steps:

1. Download the latest version of STM8/128-EVAL demonstration firmware and related user manual from www.st.com/mcu/modules.php?name=mcu&file=familiesdocs&FAM=113
2. Extract the content of the downloaded zip file to the directory of your choice
3. Power on the STM8/128-EVAL board and connect it to the Debug instrument
4. Open STVD toolchain and proceed as follows:
   a) Open a *demo.stw* project by selecting ***File>Open Workspace*** and browsing the demo project under: *\STM8-128-EVAL_Demo\Demo\project\STVD\Cosmic*
   b) Configure the Debug instrument:
      Click **Debug Instrument>Target Settings** in the **Debug Instrument Setting** window
      Select the target Debug instrument used for the debug session (SWIM STICE or SWIM RLink)
      Click OK.
   c) Click **Build>Rebuild All** to rebuild all files
   d) Click **Debug>Start Debugging** to load the demonstration image
5. Select **Debug>Run** to run the demonstration. The demonstration firmware is now programmed and you can close the debugging session.

Note: You can also load a binary file of the demonstration firmware (.s19) by using the STVP toolchain (refer to the STVP online help for details). The binary file is available under \STM8-128-EVAL_Demo\Image.

4 STM8S peripherals used

The following table lists the STM8S peripherals used in each demo:

Table 2. Peripherals used

Peripheral	Demo
ADC2	ADC, TIMER and PWM demos
EXTIT	MicroSD demo
GPIO	All demos (buttons, LEDs)
Clock Controller	All demos
BEEPER	Beeper demo
SPI	All demos (LCD + MicroSD)
I2C	PWM demos (save/restore melody)
TIM1	PWM and ADC demos (Buzzer)
TIM2	All demos (time base)
UART1	ADC demos
UART3	ADC demos

5 Demo firmware architecture

This section describes the demo firmware architecture. It is divided into two parts:

- **Library**: contains the firmware library source files. These files do not need to be modified by the user.
- **Application**: contains the specific files of the demonstration firmware that can be modified:
  - *stm8s_conf.h*: this header file is used to configure the library
  - *stm8s_it.h*: header for the *stm8s_it.c* file
  - *stm8s_it.c*: this file provides all the interrupt sub-routines
  - *stm8_interrupt_vector.c*: this file provides the interrupt vector table
  - *demo_xxx.h*: header for the demo_*xxx.c* file
  - *demo_xxx.c*: this file provides all functions related to the xxx demo
  - *functions.h*: header for the *functions.c* file
  - *functions.c*: this file provides miscellaneous functions.
  - *joystick_button.h*: header for the *joystick_button.c* file
  - *joystick_button.c*: this file provides all functions related to the management of the joystick and button
  - *mono_lcd.h*: header for the mono_*lcd.c* file
  - *mono_lcd.c*: this file provides LCD management functions
  - *main.h*: header for the *main.c* file
  - *main.c*: this file provides the main function
  - *menu.h*: header for the *menu.c* file
  - *menu.c*: this file provides menu functions and menu definition

6 Revision history

Table 3. Document revision history

Date	Revision	Changes
08-Dec-2008	1	Initial release.
27-Feb-2009	2	Added *Section 3: Upgrading the demonstration firmware*.

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